AMENDMENTS TO SPECIFICATION

Please replace the title with the following amended title:

A DEVICE [[AGE]] AGING DETERMINATION CIRCUIT

Please replace the paragraph beginning at line 4 of page 1 with the following amended paragraph:

The present invention generally relates to the field of electronic circuits. Specifically, embodiments of the present invention relate to a circuit for determining the [[age]] aging of a device.

Please replace the paragraph beginning at line 9 of page 3 with the following amended paragraph:

Various embodiments of the present invention, a device [[age]] aging determination circuit, are described. In one embodiment, two circuits are located on a device, wherein a first circuit operates at a first duty cycle and generates a first output and a second circuit operates at a second duty cycle different from said first duty cycle and generates a second output. In one embodiment, the device is an integrated circuit. In one embodiment, the first output is measured at a node of the first circuit and the second output is measured at a node of the second circuit. A measuring circuit determines a difference in the first output and the second output, wherein the difference indicates an [[age]] aging of the device. The [[age]] aging is a

representation of the amount of degradation the device has been exposed to, and allows for dynamic adjustment of operating parameters of the device to optimize performance.

Please replace the paragraph beginning at line 1 of page 5 with the following amended paragraph:

In another embodiment, the present invention provides a method for determining an [[age]] aging of a device. A first output is received from a first circuit operating at a first duty cycle, and a second output is received from a second circuit operating at second duty cycle different from the first duty cycle. A difference in the first output and the second output is determined, wherein the difference indicates an [[age]] aging of the device.

Please replace the paragraph beginning at line 9 of page 6 with the following amended paragraph:

FIGURE 2 is a block diagram of an [[age]] aging determination circuit in accordance with one embodiment of the invention

Please replace the paragraph beginning at line 21 of page 6 with the following amended paragraph:

FIGURE 6 is a flowchart diagram illustrating steps in an exemplary process for determining an [[age]] aging of a device in accordance with one embodiment of the present invention.

Please replace the paragraph beginning at line 17 of page 7 with the following amended paragraph:

Figure 1 is a block diagram showing an exemplary integrated circuit 100 upon which embodiments of the invention may be implemented. Integrated circuit 100 may be implemented on a single die and packaged as a "chip" or integrated circuit device. In one embodiment, integrated circuit 100 is a CMOS Large Scale Integration (LSI) chip. In one embodiment, integrated circuit 100 includes a number of electronic components for performing particular functions. For example, integrated circuit 100 may include a bus, memory such as random access memory (RAM) or read-only memory (ROM) for storing volatile or temporary data during firmware execution, a central processing unit (CPU) for processing information and instructions, input/output (I/O) pins providing an interface with external devices and the like, and [[age]] aging determination circuit 110.

Please replace the paragraph beginning at line 7 of page 8 with the following amended paragraph:

[[Age]] Aging determination circuit 110 is operable to perform a process for determining the maximum [[age]] aging of integrated circuit 100. Integrated circuit 100 degrades over time in part due to hot carrier injection (HCI) degradation. The magnitude of HCI degradation is related to the activity of integrated circuit 100. [[Age]] Aging determination circuit 110 has its own well-defined degradation rate and is operable to dynamically monitor the maximum usage of integrated circuit 100, such that an [[age]] aging of integrated circuit 100 can be estimated.

Please replace the paragraph beginning at line 15 of page 8 with the following amended paragraph:

Figure 2 is a block diagram of [[age]] aging determination circuit 110 in accordance with one embodiment of the invention. In one embodiment, [[age]] aging determination circuit 110 may be part of an integrated circuit (e.g., integrated circuit 100 of Figure 1). However, it should be appreciated that [[age]] aging determination circuit 110 may be utilized in conjunction with any electronic device for determining aging due to usage of the electronic device.

Please replace the paragraph beginning at line 22 of page 8 with the following amended paragraph:

In one embodiment, [[age]] aging determination circuit 110 comprises active circuit 115, quiet circuit 120, and measuring circuit 125. Active circuit 115 and quiet circuit 120 are analogous circuits with a measurable output that is subject to variation over time. In one embodiment, active circuit 115 and quiet circuit 120 are ring oscillator circuits. In one embodiment, active circuit 115 and quiet circuit 120 are 19 stage ring oscillator circuits. In one embodiment, upon initialization (e.g., at time = 0), both active circuit 115 and quiet circuit 120 run in the same manner, as they are analogous. The respective outputs of active circuit 115 and quiet circuit 120 are initially identical, as neither circuit has been exposed to HCI.

Please replace the paragraph beginning at line 10 of page 9 with the following amended paragraph:

In another embodiment, while active circuit 115 and quiet circuit 120 run in the same manner, as they are analogous circuits, upon initialization the outputs are not identical. For example, process variation in manufacturing the circuits could result in an initial offset of the outputs. In one embodiment, the initial offset is stored in non-volatile memory of [[age]] aging determination circuit 110. In another embodiment, the initial offset is stored in a fuse of [[age]] aging determination circuit 110. In one embodiment, the initial offset is stored in non-volatile memory of the device (e.g., integrated circuit 100 of Figure 1). In another embodiment, the initial offset is stored in a fuse of the device.

Please replace the paragraph beginning at line 21 of page 11 with the following amended paragraph:

The difference of the outputs between active circuit 115 and quiet circuit 120 can be used as an indicator as to the amount the device has been exposed to HCI. In other words, it is possible to measure the [[age]] aging of the device relative to its usage.

Please replace the paragraph beginning at line 7 of page 16 with the following amended paragraph:

With reference to Figure 2, [[age]] aging determination circuit 110 is operable to determine the output difference between active circuit 115 and quiet circuit 120. The output difference may be used as an indicator of how much a device (e.g., integrated circuit 100 of Figure 1) has been exposed to HCI. In one embodiment, the output

difference is converted to an estimated [[age]] aging of the device. This conversion is design dependent, and depends on the particular circuits used as active circuit 115 and quiet circuit 120.

Please replace the paragraph beginning at line 4 of page 17 with the following amended paragraph:

Figure 6 is a flowchart diagram illustrating steps in an exemplary process 600 for determining an [[age]] aging of a device in accordance with one embodiment of the present invention. In one embodiment, process 600 is performed by an [[age]] aging determination circuit (e.g., [[age]] aging determination circuit 110 of Figures 1 and 2) that is coupled to an electronic device (e.g., integrated circuit 100 of Figure 1). Although specific steps are disclosed in process 600, such steps are exemplary. That is, the embodiments of the present invention are well suited to performing various other steps or variations of the steps recited in Figure 6.

Please replace the paragraph beginning at line 7 of page 18 with the following amended paragraph:

At step 640, a difference between the first output and the second output is determined, wherein the difference indicates an [[age]] aging of the device. In one embodiment, the difference is determined by compensating for an initial offset of the first output and the second output. As described above, the difference may be used as an indicator of how much a device (e.g., integrated circuit 100 of Figure 1) has been exposed to HCI. In one embodiment, the difference is converted to an estimated [[age]] aging of the device. This conversion is design dependent, and depends on the

particular circuits used as the active circuit and the quiet circuit. In another embodiment, the difference is used to optimize the trade-off between performance and lifetime of the device.

Please replace the paragraph beginning at line 18 of page 18 with the following amended paragraph:

Various embodiments of the present invention, a device [[age]] aging determination circuit, are thus described. While the present invention has been described in particular embodiments, it should be appreciated that the present invention should not be construed as limited by such embodiments, but rather construed according to the below claims.

Please replace the Abstract paragraph beginning at line 4 of page 28 with the following amended Abstract paragraph:

A device [[age]] aging determination circuit. Circuits are located on a device, including a first circuit operating at a first duty cycle and generating a first output and a second circuit operating at a second duty cycle different from said first duty cycle and generating a second output. A measuring circuit determines a difference in the first output and the second output, wherein the difference indicates an [[age]] aging of the device. The [[age]] aging is a representation of how much degradation the device has been exposed to, and allows for dynamic adjustment of operating parameters of the device to optimize performance.